CLAIMS

1. A semiconductor device having a field effect transistor formed in a semiconductor layer provided on a insulating layer, comprising:

a body electrode electrically connected to a channel forming region of said field effect transistor; and

a back gate electrode provided below the insulating layer as opposed to the channel forming region of said field effect transistor.

2. A semiconductor device having a field effect transistor formed in a semiconductor layer provided on an insulating layer, comprising:

a body electrode electrically connected to a channel forming region of said field effect transistor; and

a back gate electrode provided below the insulating layer as opposed to the channel forming region of said field effect transistor, and

wherein said body electrode and said back gate electrode are respectively formed in a semiconductor region of conduction type opposite to a channel of said field effect transistor.

3. A semiconductor device having a semiconductor

base in which a second semiconductor layer is formed on a first semiconductor layer with an insulating layer interposed therebetween, and a field effect transistor formed in the second semiconductor layer, comprising:

a body electrode formed in the second semiconductor layer and comprised of a semiconductor region electrically connected to a channel forming region of said field effect transistor; and

a back gate electrode formed in said first semiconductor layer and comprised of a semiconductor region brought into contact with the insulating layer, and

wherein said back gate electrode is provided as opposed to the channel forming region of said field effect transistor, and the semiconductor region corresponding to said body electrode and the semiconductor region corresponding to said back gate electrode are respectively formed in a conduction type opposite to a channel of said field effect transistor.

4. The semiconductor device according to any of claims 1 to 3, wherein a potential for controlling carriers of conduction type opposite to a channel formed in an upper portion of the channel forming region of said field effect transistor is applied to each of said body electrode and said back gate electrode.

5. The semiconductor device according to any of claims 1 to 4, wherein a potential for inducing an electrical charge of conduction type opposite to the channel formed in the upper portion of the channel forming region of said field effect transistor, in a lower portion of said semiconductor layer opposite to said back gate electrode is applied to each of said body electrode and said back gate electrode.

6. A semiconductor device having a first conduction type field effect transistor and a second conduction type field effect transistor formed in a semiconductor layer provided on an insulating film, comprising:

a first body electrode electrically connected to a channel forming region of said first conduction type field effect transistor;

a first back gate electrode provided below said insulating layer in an opposing relationship to the channel forming region of said first conduction type field effect transistor;

a second body electrode electrically connected to a channel forming region of said second conduction type field effect transistor; and

a second back gate electrode provided below said insulating layer as opposed to the channel forming region of said second conduction type field effect transistor.

7. A semiconductor device having a first conduction type field effect transistor and a second conduction type field effect transistor formed in a semiconductor layer provided on an insulating film, comprising:

a first body electrode electrically connected to a channel forming region of said first conduction type field effect transistor;

a first back gate electrode provided below said insulating layer in an opposing relationship to the channel forming region of said first conduction type field effect transistor;

a second body electrode electrically connected to a channel forming region of said second conduction type field effect transistor; and

a second back gate electrode provided below said insulating layer as opposed to the channel forming region of said second conduction type field effect transistor, and

wherein said first body electrode and said first back gate electrode are respectively formed in a semiconductor region of conduction type opposite to a channel of said first conduction type field effect transistor, and said second body electrode and said second back gate electrode are respectively formed in a semiconductor region of conduction type opposite to a channel of said second conduction type field effect transistor.

2. A semiconductor device having a semiconductor base in which a second semiconductor layer is formed on a first semiconductor layer with an insulating layer interposed therebetween, and a first conduction type field effect transistor and a second conduction type field effect transistor both formed in the second semiconductor layer, comprising:

a first body electrode formed in the second semiconductor layer and comprised of a semiconductor region electrically connected to a channel forming region of said first conduction type field effect transistor;

a first back gate electrode formed in the first semiconductor layer and comprised of a semiconductor region brought into contact with the insulating layer;

a second body electrode formed in the second semiconductor layer and comprised of a semiconductor region electrically connected to a channel forming region of said second conduction type field effect transistor; and

a second back gate electrode formed in the first semiconductor layer and comprised of a semiconductor region brought into contact with the insulating layer, and

wherein said first back gate electrode is provided as opposed to the channel forming region of said first conduction type field effect transistor, said second back

gate electrode is provided as opposed to the channel forming region of said second conduction type field effect transistor, the semiconductor region used as said first body electrode and the semiconductor region used as said first back gate electrode are respectively formed in a conduction type opposite to a channel of said first conduction type field effect transistor, and the semiconductor region used as said second body electrode and the semiconductor region used as said second back gate electrode are respectively formed in a conduction type opposite to a channel of said second conduction type field effect transistor.

9. The semiconductor device according to claim 8, wherein the semiconductor region used as said first back gate electrode and the semiconductor region used as said second back gate electrode are respectively electrically separated from said second semiconductor layer.

10. The semiconductor device according to any of claims 6 to 9, wherein a potential for controlling carriers of conduction type opposite to a channel formed in an upper portion of the channel forming region of said first conduction type field effect transistor is applied to each of said first body electrode and said first back gate electrode, and a potential for controlling carriers of conduction type opposite to a channel formed in an

upper portion of the channel forming region of said second conduction type field effect transistor is applied to each of said body electrode and said back gate electrode.

11. The semiconductor device according to any of claims 6 to 9, wherein a potential for inducing an electrical charge of conduction type opposite to the channel formed in the upper portion of the channel forming region of said first conduction type field effect transistor, in a lower portion of said semiconductor layer opposite to said first back gate electrode is applied to each of said first body electrode and said fist back gate electrode, and a potential for inducing an electrical charge of conduction type opposite to the channel formed in the upper portion of the channel forming region of said second conduction type field effect transistor, in a lower portion of said semiconductor layer opposite to said second back gate electrode is applied to each of said second body electrode and said second back gate electrode.

12. A method of driving a semiconductor device having a field effect transistor formed in a semiconductor layer provided on an insulating layer, a body electrode electrically connected to a channel forming region of said field effect transistor, and a

back gate electrode provided below the insulating layer in an opposing relationship to the channel forming region of said field effect transistor, comprising the following step of:

applying a potential lying in a direction to induce an electrical charge of conduction type opposite to a channel formed in a surface layer of the channel forming region of said field effect transistor, in a lower portion of the channel forming region thereof to said body electrode and said back gate electrode or at least said back gate electrode so as to increase a threshold voltage of said field effect transistor.

13. A method of driving a semiconductor device having a field effect transistor formed in a semiconductor layer provided on an insulating layer, a body electrode electrically connected to a channel forming region of said field effect transistor, and a back gate electrode provided below the insulating layer in an opposing relationship to the channel forming region of said filed effect transistor, comprising the following step of:

applying a potential lying in a direction to induce an electrical charge of conduction type opposite to a channel formed in a surface layer of the channel forming region of said field effect transistor, in a lower portion of the channel forming region thereof to said

body electrode and said back gate electrode or at least said back gate electrode so as to stabilize a threshold voltage of said field effect transistor and increase a withstand voltage of the drain thereof.

14. A method of driving a semiconductor device having a first conduction type field effect transistor and a second conduction type field effect transistor both formed in a semiconductor layer provided on an insulating layer, a first body electrode electrically connected to a channel forming region of said first conduction type field effect transistor, a first back gate electrode provided below the insulating layer as opposed to the channel forming region of said first conduction type field effect transistor, a second body electrode electrically connected to a channel forming region of said second conduction type field effect transistor, and a second back gate electrode provided below the insulating layer as opposed to the channel forming region of said second conduction type field effect transistor, comprising the following steps of:

in a first conduction type field effect transistor and a second conduction type field effect transistor constituting a predetermined circuit block, applying a potential lying in a direction to induce an electrical charge of conduction type opposite to a channel formed in a surface layer of the channel forming region of said

first conduction type field effect transistor, in a lower portion of the channel forming region thereof to said first body electrode and said first back gate electrode or at least said first back gate electrode so as to increase a threshold voltage of said first conduction type field effect transistor to thereby allow low power consumption, applying a potential lying in a direction to induce an electrical charge of conduction type opposite to a channel formed in a surface layer of the channel forming region of said second conduction type field effect transistor, in a lower portion of the channel forming region thereof to said second body electrode and said second back gate electrode or at least said second back gate electrode so as to increase a threshold voltage of said second conduction type field effect transistor to thereby allow low power consumption, and activating each of a first conduction type field effect transistor and a second conduction type field effect transistor constituting another circuit block at high speed in a state of being brought to a low threshold voltage.

15. A method of driving a semiconductor device having a first conduction type field effect transistor and a second conduction type field effect transistor both formed in a semiconductor layer provided on an insulating layer, a first body electrode electrically connected to a channel forming region of said first conduction type

field effect transistor, a first back gate electrode provided below the insulating layer as opposed to the channel forming region of said first conduction type field effect transistor, a second body electrode electrically connected to a channel forming region of said second conduction type field effect transistor, and a second back gate electrode provided below the insulating layer as opposed to the channel forming region of said second conduction type field effect transistor, comprising the following steps of:

changing with time, potentials applied to said first back gate electrode and said second back gate electrode, or said first back gate electrode, said second back gate electrode, said first body electrode and said second body electrode; and

thereby varying characteristics of said first conduction type field effect transistor and said second conduction type field effect transistor.

16. A method of testing a semiconductor device having a first conduction type field effect transistor and a second conduction type field effect transistor both formed in a semiconductor layer provided on an insulating layer, a first body electrode electrically connected to a channel forming region of said first conduction type field effect transistor, a first back gate electrode provided below the insulating layer as opposed to the

channel forming region of said first conduction type field effect transistor, a second body electrode electrically connected to a channel forming region of said second conduction type field effect transistor, and a second back gate electrode provided below the insulating layer as opposed to the channel forming region of said second conduction type field effect transistor, comprising the following step of:

measuring a leak current in a state in which potentials are respectively applied to said first back gate electrode and said second back gate electrode, or said first back gate electrode, said second back gate electrode, said first body electrode and said second body electrode so as to increase threshold voltages of said first conduction type field effect transistor and said second field effect transistor.

17. A method of aging a semiconductor device having a field effect transistor formed in a semiconductor layer provided on an insulating layer, a body electrode electrically connected to a channel forming region of said field effect transistor, and a back gate electrode provided below the insulating layer as opposed to the channel forming region of said field effect transistor, comprising the following step of:

performing aging in a state in which a potential is applied to said back gate electrode or said back gate

electrode and said body electrode.

14. A method of using a semiconductor device having a field effect transistor formed in a semiconductor layer provided on an insulating layer and having a body electrode electrically connected to a channel forming region of said field effect transistor, and a back gate electrode provided below the insulating layer as opposed to the channel forming region of said field effect transistor, comprising the following steps of:

forming a channel of conduction type opposite to a channel formed in a surface layer of the channel forming region of said field effect transistor at a lower portion of the channel forming region thereof, based on a potential applied to said body electrode and a potential applied to said back gate electrode; and

using said semiconductor device in a state in which said former channel and part of a depletion layer of a drain region for said field effect transistor are terminated.